




UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,907	02/12/2002	Soo Seok Choi	1567.1022	3556
21171	7590	07/06/2004	EXAMINER	
STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			ALEJANDRO, RAYMOND	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 07/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/072,907	Applicant(s) CHOI ET AL.	
	Examiner Raymond Alejandro	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 29-39 is/are pending in the application.
- 4a) Of the above claim(s) 29-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 38 and 39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
- 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
- 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This is in response to the amendment filed 05/17/04. The applicants have overcome the objections and the 35 USC 102 rejection. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments. However, the present claims are finally rejected over art as seen below and for the reasons of record:

Election/Restrictions

1. This application contains claims 29-37 drawn to an invention nonelected with traverse in the reply filed on 01/06/04. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Language Suggestion

2. Claim 39: it is suggested to delete the term "suitable" as to have a better understanding of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

Art Unit: 1745

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-4, 8-17 and 38-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu 5523179 in view of Gorkovenko et al 2003/0003360.

The present claims are drawn to a lithium-sulfur battery wherein the disclosed inventive concept comprises the specific positive active material.

As to claims 1-3:

Chu discloses battery cells comprising a sulfur-based positive composite electrode wherein the active sulfur is elemental sulfur or sulfur containing discharge products of elemental sulfur; a negative electrode comprises lithium metal such as lithium metal or lithium-aluminum alloys (ABSTRACT/CLAIM 1/ CLAIM 9). It is disclosed that the positive electrode comprises an electronically conductive material and an ionically conductive material (COL 5, lines 1-9). The electrolyte separator is also taught (CLAIM 1). It is disclosed that the electrolyte separator for solid state batteries functions as a separator for the positive and the negative electrodes, and as a transport medium for the metal ions (COL 11, lines 9-15). It is also disclosed that for battery cells containing a liquid electrolyte such battery format contains a separator within the liquid electrolyte (COL 11, lines 35-42). *Thus, the battery cell has a separator and an ion-conducting electrolyte.*

As to claims 4, 8, 10-14, and 16:

Chu teaches the use of elemental sulfur per se and conductive material (COL 4, lines 27-35/ COL 5, lines 1-15); it is disclosed that the term "active sulfur is defined to be elemental sulfur or sulfur that would be elemental if the positive electrode were in its theoretical fully charged state (COL 8, lines 32-35); it may also comprise binders (COL 5, lines 25-28). This composition is intermixed (COL 5, lines 1-8); it's dispersed in a composite matrix by being mixed (COL 8, line 45 to COL 10, line 10). It is disclosed that the positive electrode slurry is cast directly onto a SS current collector (COL 10, lines 58-65).

Furthermore, as to the method limitation, i.e. i) mixing (ball mill), ii) coating, iii) removing, iv) injecting, v) employment of a plasticizer and its removing solvent and the likes, it is further noted that a method limitation incorporated into a product claim does not patentable distinguish the product because what is given patentably consideration is the product itself and not the manner in which the product was made. Therefore, the patentability of a product is independent of how it was made. In this regard, it is thus noted that since the plasticizer is removed from the positive electrode, the plasticizer and the removing solvent are not an active constituent of said positive electrode. That is, the plasticizer and the removing solvent were just employed as part of the preparation technique but the plasticizer was removed thereafter by using the solvent. Further, since the porosity of the positive electrode as claimed also includes "0 (zero) porosity" or "a pore-free material", it is hence asserted that no plasticizer and removing solvent is required.

As to claim 9:

Chu discloses the presence of polysulfide form material (COL 4, lines 30-36/ COL 4, lines 60-65).

Art Unit: 1745

As to claim 15:

Chu discloses the use of, at least, polyethylene oxide (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15).

As to claim 17:

Chu discloses the ionic conductor in the positive electrode can be any of the solid-state or gel-state electrolytes described in the electrolyte separators and liquid electrolyte sections (COL 10, lines 23-27) as well as any electronically insulating and ionically conductive material which is electrochemically stable may be used (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15). In particular, Chu teaches the following organic liquids of the battery cell incorporating the positive electrode: propylene carbonate; ethylene carbonate, N-methylpyrrolidinone, butyrolactone, tetramethylurea and the likes (COL 11, lines 26-35).

As to claims 38:

Chu teaches the employment of solid electrolytes (Col 11, lines 8-15/ COL 5, lines 62-67/ Col 10, lines 23-27).

As to claim 39:

Chu teaches the use of polymeric, glass and/or ceramic materials are appropriate as solid-state electrolyte separators (Col 5, lines 62-67).

Chu et al disclose a lithium-sulfur battery comprising a sulfur-based positive composite electrode according to the foregoing aspects. However, Chu et al does not expressly disclose the specific pore size.

As to claims 1-3:

Gorkovenko et al disclose cathodes comprising electroactive sulfur materials and batteries comprising the same (TITLE). It is disclosed that the solid composite cathode comprises a desired porosity (SECTION 0098); particularly, it is disclosed that the solid composite cathode comprising a sulfur-containing cathode active material (*thus, including sulfur*) can be fabricated having an interconnected, rigid network, typically sub-micron-pores (SECTION 0108). *Thus, it is noted that Gorkovenko et al envisage positive active material including sulfur with a pore size of less than 1 μm , as the term "submicron" encompasses dimensions no greater than 1 μm .*

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make Chu et al's positive active material including sulfur by having the specific pore size of Gorkovenko et al as Gorkovenko et al teach that sulfur-containing cathode active material having the specified pore size are useful as cathode actives material and results in an interconnected, rigid network. *Thus, Gorkovenko et al directly teach the use of cathode active materials having a pore size within the claimed range.*

6. Claims 1-4, 8-17 and 38-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu 5523179 in view of Ishida et al 4881026.

The present claims are drawn to a lithium-sulfur battery wherein the disclosed inventive concept comprises the specific positive active material.

As to claims 1-3:

Chu discloses battery cells comprising a sulfur-based positive composite electrode wherein the active sulfur is elemental sulfur or sulfur containing discharge products of elemental

Art Unit: 1745

sulfur; a negative electrode comprises lithium metal such as lithium metal or lithium-aluminum alloys (ABSTRACT/CLAIM 1/ CLAIM 9). It is disclosed that the positive electrode comprises an electronically conductive material and an ionically conductive material (COL 5, lines 1-9). The electrolyte separator is also taught (CLAIM 1). It is disclosed that the electrolyte separator for solid state batteries functions as a separator for the positive and the negative electrodes, and as a transport medium for the metal ions (COL 11, lines 9-15). It is also disclosed that for battery cells containing a liquid electrolyte such battery format contains a separator within the liquid electrolyte (COL 11, lines 35-42). *Thus, the battery cell has a separator and an ion-conducting electrolyte.*

As to claims 4, 8, 10-14, and 16:

Chu teaches the use of elemental sulfur per se and conductive material (COL 4, lines 27-35/ COL 5, lines 1-15); it is disclosed that the term “active sulfur is defined to be elemental sulfur or sulfur that would be elemental if the positive electrode were in its theoretical fully charged state (COL 8, lines 32-35); it may also comprise binders (COL 5, lines 25-28). This composition is intermixed (COL 5, lines 1-8); it’s dispersed in a composite matrix by being mixed (COL 8, line 45 to COL 10, line 10). It is disclosed that the positive electrode slurry is cast directly onto a SS current collector (COL 10, lines 58-65).

Furthermore, as to the method limitation, i.e. i) mixing (ball mill), ii) coating, iii) removing, iv) injecting, v) employment of a plasticizer and its removing solvent and the likes, it is further noted that a method limitation incorporated into a product claim does not patentable distinguish the product because what is given patentably consideration is the product itself and not the manner in which the product was made. Therefore, the patentability of a product is

Art Unit: 1745

independent of how it was made. In this regard, it is thus noted that since the plasticizer is removed from the positive electrode, the plasticizer and the removing solvent are not an active constituent of said positive electrode. That is, the plasticizer and the removing solvent were just employed as part of the preparation technique but the plasticizer was removed thereafter by using the solvent. Further, since the porosity of the positive electrode as claimed also includes "0 (zero) porosity" or "a pore-free material", it is hence asserted that no plasticizer and removing solvent is required.

As to claim 9:

Chu discloses the presence of polysulfide form material (COL 4, lines 30-36/ COL 4, lines 60-65).

As to claim 15:

Chu discloses the use of, at least, polyethylene oxide (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15).

As to claim 17:

Chu discloses the ionic conductor in the positive electrode can be any of the solid-state or gel-state electrolytes described in the electrolyte separators and liquid electrolyte sections (COL 10, lines 23-27) as well as any electronically insulating and ionically conductive material which is electrochemically stable may be used (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15). In particular, Chu teaches the following organic liquids of the battery cell incorporating the positive electrode: propylene carbonate; ethylene carbonate, N-methylpyrrolidinone, butyrolactone, tetramethylurea and the likes (COL 11, lines 26-35).

As to claims 38:

Chu teaches the employment of solid electrolytes (Col 11, lines 8-15/ COL 5, lines 62-67/ Col 10, lines 23-27).

As to claim 39:

Chu teaches the use of polymeric, glass and/or ceramic materials are appropriate as solid-state electrolyte separators (Col 5, lines 62-67).

Chu et al disclose a lithium-sulfur battery comprising a sulfur-based positive composite electrode according to the foregoing aspects. However, Chu et al does not expressly disclose the specific pore size.

As to claims 1-3:

Ishida et al disclose that a sodium-sulfur cell (*thus, including sulfur*) (TITLE). It is also disclosed that known publication discloses the structure of an Na/S cell in which a conductive composite having a porosity of 50-98 % and a pore diameter of 10-1000 μm is used to constitute its positive electrode (COL 2, lines 29-37).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make Chu et al's positive active material including sulfur by having the specific pore size of Ishida et al because Ishida et al discloses known publications teaching the use of conductive composites having the specific pore size for constituting positive electrodes. Thus, Ishida et al discloses such cathodes having the specific pore size are conductive and can be used in electrochemical applications. *Hence, Ishida et al directly teach the use of sulfur cathode active materials having a pore size within the claimed range. Furthermore, Ishida et al and Chu et al share the same field of endeavor as they both address and disclose alkali metal-sulfur based batteries and their related technologies.*

7. Claims 1-4, 8-17 and 38-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu 5523179 in view of Cairns et al 3716409.

The present claims are drawn to a lithium-sulfur battery wherein the disclosed inventive concept comprises the specific positive active material.

As to claims 1-3:

Chu discloses battery cells comprising a sulfur-based positive composite electrode wherein the active sulfur is elemental sulfur or sulfur containing discharge products of elemental sulfur; a negative electrode comprises lithium metal such as lithium metal or lithium-aluminum alloys (ABSTRACT/CLAIM 1/ CLAIM 9). It is disclosed that the positive electrode comprises an electronically conductive material and an ionically conductive material (COL 5, lines 1-9). The electrolyte separator is also taught (CLAIM 1). It is disclosed that the electrolyte separator for solid state batteries functions as a separator for the positive and the negative electrodes, and as a transport medium for the metal ions (COL 11, lines 9-15). It is also disclosed that for battery cells containing a liquid electrolyte such battery format contains a separator within the liquid electrolyte (COL 11, lines 35-42). *Thus, the battery cell has a separator and an ion-conducting electrolyte.*

As to claims 4, 8, 10-14, and 16:

Chu teaches the use of elemental sulfur per se and conductive material (COL 4, lines 27-35/ COL 5, lines 1-15); it is disclosed that the term “active sulfur is defined to be elemental sulfur or sulfur that would be elemental if the positive electrode were in its theoretical fully charged state (COL 8, lines 32-35); it may also comprise binders (COL 5, lines 25-28). This

Art Unit: 1745

composition is intermixed (COL 5, lines 1-8); it's dispersed in a composite matrix by being mixed (COL 8, line 45 to COL 10, line 10). It is disclosed that the positive electrode slurry is cast directly onto a SS current collector (COL 10, lines 58-65).

Furthermore, as to the method limitation, i.e. i) mixing (ball mill), ii) coating, iii) removing, iv) injecting, v) employment of a plasticizer and its removing solvent and the likes, it is further noted that a method limitation incorporated into a product claim does not patentable distinguish the product because what is given patentably consideration is the product itself and not the manner in which the product was made. Therefore, the patentability of a product is independent of how it was made. In this regard, it is thus noted that since the plasticizer is removed from the positive electrode, the plasticizer and the removing solvent are not an active constituent of said positive electrode. That is, the plasticizer and the removing solvent were just employed as part of the preparation technique but the plasticizer was removed thereafter by using the solvent. Further, since the porosity of the positive electrode as claimed also includes "0 (zero) porosity" or "a pore-free material", it is hence asserted that no plasticizer and removing solvent is required.

As to claim 9:

Chu discloses the presence of polysulfide form material (COL 4, lines 30-36/ COL 4, lines 60-65).

As to claim 15:

Chu discloses the use of, at least, polyethylene oxide (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15).

As to claim 17:

Art Unit: 1745

Chu discloses the ionic conductor in the positive electrode can be any of the solid-state or gel-state electrolytes described in the electrolyte separators and liquid electrolyte sections (COL 10, lines 23-27) as well as any electronically insulating and ionically conductive material which is electrochemically stable may be used (COL 10, lines 46-55/ COL 9, lines 45-60/ COL 5, lines 9-15). In particular, Chu teaches the following organic liquids of the battery cell incorporating the positive electrode: propylene carbonate; ethylene carbonate, N-methylpyrrolidinone, butyrolactone, tetramethylurea and the likes (COL 11, lines 26-35).

As to claims 38:

Chu teaches the employment of solid electrolytes (Col 11, lines 8-15/ COL 5, lines 62-67/ Col 10, lines 23-27).

As to claim 39:

Chu teaches the use of polymeric, glass and/or ceramic materials are appropriate as solid-state electrolyte separators (Col 5, lines 62-67).

Chu et al disclose a lithium-sulfur battery comprising a sulfur-based positive composite electrode according to the foregoing aspects. However, Chu et al does not expressly disclose the specific pore size.

As to claims 1-3:

Cairns et al disclose cathodes for electrochemical power producing cells (TITLE) wherein the cathode comprises sulfur-containing graphite or sulfur impregnated graphite (thus, including sulfur) having an average pore size of 1.4 μ (COL 10, lines 60-63 and COL 11, line 55-59)

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make Chu et al's positive active material including sulfur by having the specific pore size of Cairns et al because Cairns et al disclose power producing cells containing the cathode structure comprising such pore size exhibits good cell performance. Thus, since the performance of the cell is very good, it yields an improved capacity density. *Hence, Ishida et al directly teach the use of sulfur-containing graphite or sulfur impregnated graphite having a pore size within the claimed range. Furthermore, Cairns et al is pertinent and relevant to Chu et al because they both address and solve the same problem of providing suitable cathodes for electrochemical power-producing cells.*

8. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu 5523179 in view of: a) Gorkovenko et al 2003/0003360, or b) Ishida et al 4881026, or c) Cairns et al 3716409 as applied to claim 4 above in paragraphs 5 or 6 or 7, and further in view of Kovalev et al 6652440.

Chu and Gorkovenko et al, or Ishida et al or Cairns et al are applied, argued and incorporated herein for the reasons above. However, the preceding prior art does not expressly disclose the specific particle size of the elemental sulfur.

Kovalev et al teach electroactive cathode materials for electrochemical cells (COL 1, lines 10-15) wherein the cathode materials comprise sulfur-sulfur bond such as elemental sulfur (COL 1, lines 43-50). It is disclosed that such cathode materials are useful in batteries employing alkali-metal anode, in particular, lithium or lithium-alloy anodes (COL 1, lines 35-53/COL 16, lines 64-67). It is further disclosed that in one embodiment, **the particle size of elemental sulfur**

Art Unit: 1745

is from 0.01 to 100 microns (COL 5, lines 18-20/COL 12, lines 7-9). *It is noted that Kovalev et al's particle size range encompasses, at least, particle sizes up to 20 μm , or 10 μm or 5 μm .*

In light of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use the specific particle size of the elemental sulfur of Kovalev et al in the lithium-sulfur battery of Chu-Gorkovenko et al, or Chu-Ishida et al or Chu-Cairns et al as Kovalev et al teach that elemental sulfur having the claimed particle size is useful for making positive electrode of lithium-sulfur batteries because this particular positive electrode material exhibits satisfactory specific capacity in combination with a lithium anode. As a consequence, lithium-sulfur batteries employing elemental sulfur having the claimed particle size as positive electrode achieves high energy capacity and rechargeability by the electrochemical cleavage via reduction and reformation via oxidation of the elemental sulfur. *Hence, Kovalev et al directly teach the use of elemental sulfur having a particle size within the claimed range.*

Response to Arguments

9. Applicant's arguments, see the amendments filed 05/17/04 for specific details, with respect to the rejection(s) of claim(s) 1-4, 8-17 and 38-39 under the 35 USC 102 statute have been fully considered and are persuasive. Therefore, the rejection has been overcome. However, upon further consideration, new grounds of rejections are made as seen above. Accordingly, applicant's arguments with respect to the claims 1-17 and 38-39 have been considered but are moot in view of the new ground(s) of rejection.

10. Having addressed the specific pore size limitation in the rejections presented hereinabove, applicants' arguments now reduce to the assertion that the size of the particles has

an effect on the life cycle of the resulting battery (unexpected results) as shown by the Examples in Table 1, that is, applicants have argued that “the recited range imparts a novel feature...because the particular range is critical”.

In this respect, it is noted that applicants’ results show that the particular range is critical for a particle size of 5 μm only. For example, EXAMPLES 1-4 show the use of particle sizes of 5 μm only (SEE EXAMPLES 1-4). Further, Applicants are also comparing EXAMPLES 1-4 having a particle size of 5 μm with COMPARATIVE EXAMPLES 1-2 having particle sizes of 30 μm and 15 μm , respectively. Thus, as apparently admitted by the applicants, there is no unexpected result for the claimed range of particle sizes greater than 15 μm . In consequence, criticality of particle sizes above 15 μm (from the claimed range of 15- 20 μm) is neglectable as indicated by applicants in paragraphs 0058-0062 because “the capacities of the cells of EXAMPLES 1-4 were reduced by 40-30 %, while those of COMPARATIVE EXAMPLES 1-2 were reduced by 70 % and 45 %, respectively” (paragraph 0058); “As shown in Table 2, the lithium-sulfur cell of EXAMPLE 5 has a discharge capacity retention that is about twice as high as those of COMPARATIVE EXAMPLES 1 and 2” (paragraph 0061); “Referring Fig. 5, the cycle life of the cell of EXAMPLE 5 is significantly improved over the cells of COMPARATIVE EXAMPLES 1-2” (paragraph 0062).

In addition, the results of Tables 1-2 of which applicants claim to show unexpected results are only commensurate with the specific particle size of 5 μm . Hence, applicants have failed to provide objective evidence establishing the advantage of particle sizes throughout the entire claimed range (i.e. greater than 0 μm up to 5, 10 or 20 μm , respectively). Thus, it is considered that particle sizes immediately below 5 μm and greater than 5 μm (*i.e.* $0 < \text{particle}$

size (μm) < 5 and $5 < \text{particle size } (\mu\text{m}) \leq 15$) has no effect on the life cycle of the resulting battery. Therefore, since the prior art directly teaches particle sizes smaller than 5 μm as well as greater than 5 μm , a prima-facie case of obviousness still exists. Applicants' attention is respectfully directed to *MPEP 2144.05 [R-1] Obviousness of Ranges* where is stated that in the case where the claimed range lie inside a range disclosed by the prior art a prima-facie case of obviousness exists. *In re Wertheim 191 USPQ 90*; or at least, is sufficient to establish a prima-facie case of obviousness. *In re Peterson 65 USPQ2d 1379*.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Examiner
Art Unit 1745

A handwritten signature in black ink, appearing to be 'RAM' with a stylized flourish at the end.